Dirty Electronics *Hope*

Festival of Britain 60th Anniversary

Festival Hall (Clore Ballroom), 13 - 14 August (11.00 – 4.00)
John Richards 2011, 2nd Ed.

John Richards (Dirty Electronics) will be creating a large-scale public artwork entitled *Hope* as part of the Festival of Britain 60th Anniversary at the Festival Hall, Southbank Centre, London, 13 and 14 August. The public will be able to drop in to a free workshop and build a tiny 'grain' synthesizer that omits a very short repeated sound and visually concurrent blinking LED. As the weekend progresses, the grains of sound are amassed into an installation to create an evolving sound and visual texture. It is only through a collective effort that the final piece is realised. From the basis of adding 'simple' grains of sound and light, a complex stochastic process and experience is produced. The work explores the themes of mass production and individualism, the hand-made and collective process in the creation of an artwork. A limited edition Festival of Britain Emblem Synth will also be produced in collaboration with Black Country Atelier.

The circuit uses the integrated circuit (IC) CMOS 4093. This IC contains four (quad) Schmitt trigger NAND gates. Two gates are used to create a gated astable multivibrator (oscillator). The frequency of the oscillator (frequency/pitch) and the timing of the gate (density/pulse) can be adjusted by trimpots. A diode is also used to achieve a duty cycle of less than fifty percent (a shorter pulse). A general purpose NPN transistor is used to drive the piezo transducer. The piezo used for *Hope* has resonant frequencies around 2k8 and 4k4. The piezo transducer will be louder when tuned to these frequencies.

Part List

CMOS4093
DIL Socket (DIL-14 pin)

R1 4k7
R2 1k
R3 1k
R4 1k

VR1 100k
VR2 100k

C1 100 uF
C2 47 nF (5mm pitch)

D1 1N4148

Q1 BC548
LED (3mm superbright)

Battery Clip

Switch (SPST/SPDT)
Piezo Transducer (c. 30 mm)

Stripboard and wire

STEP-BY-STEP

Look carefully at the component layout diagram and the example circuit/circuits. When cutting stripboard use a knife scoring through the holes on both sides of the the board. Snap board over a firm edge. The strips can be cut using a 3mm drill bit. Twist drill with the hand making a circular indent until copper strip is completely broken.

1. Soldering. Hold soldering iron against the part to solder for a few seconds to heat it up, then apply solder. Solder joints should look like Mount Fuji (wide base) and not like an onion dome of a Russian church. Solder can run horizontally along the strips, but not, in most cases, across/vertically.

2. Check the orientation of the board in relation to the holes and the copper strips.

3. Start with the integrated circuit (IC) socket. The notch in the socket should be at the top (the IC goes into its socket when everything else is complete).

4. Use Blu-Tack as a third hand to keep the part in place. Turnover the board and solder two diagonal pins of the socket.

5. Check to see that the socket is flush with the board. Solder the remaining pins of the socket.

6. Work from the centre outwards, and from low to high components. Leave the bulkier parts to the end.

7. The vertical lines on the component layout diagram are jumper wires. Either tinned/bare metal or insulated wire may be used. Solder wire as per components described in 9. See also 14 for tinning wire.

8. The diode, small orange and black complement, has a polarity. The black ring/end is negative.

9. In most cases the components should be flush with the board. Put the component through holes in the stripboard in the correct position. Turn the board over and splay the component's legs. Keep the legs long. Solder first then trim the legs with wire cutters. Trim just above the solder joint.

10. Some resistors are positioned vertically to save space. These resistors should be bent with the fingers into a hairpin shape. Splay legs and solder as above.

11. The tall dark blue cylindrical capacitor (electrolytic) has a polarity. The short leg is the negative. The capacitor also has a light blue stripe/minus signs on the negative side.

12. The LED is also polarised. The short leg and flat side of the LED is negative.

13. Solder the larger components to the board (trimpots, jack socket, piezo transducer).

14. Use insulated jumper wire to connect the remaining components. These jumper wires are illustrated on the component layout diagram by dashed lines. Strip a couple of millimeters of insulation from both ends of the wire and tin the ends (a coating of solder to help bond the wire).

15. Solder the battery clip wires directly to the board (red +, black -).

16. Put the shafts in the trimpots.

17. Slight squeeze the legs of the IC together and push it into the socket. THE NOTCH IN THE IC SHOULD BE AT THE TOP.

18. Connect the battery. The battery may be fixed to the back of the board with Blu-Tack. Make sure the case of the battery does not touch the solder joints or copper strips (this may cause a short circuit).

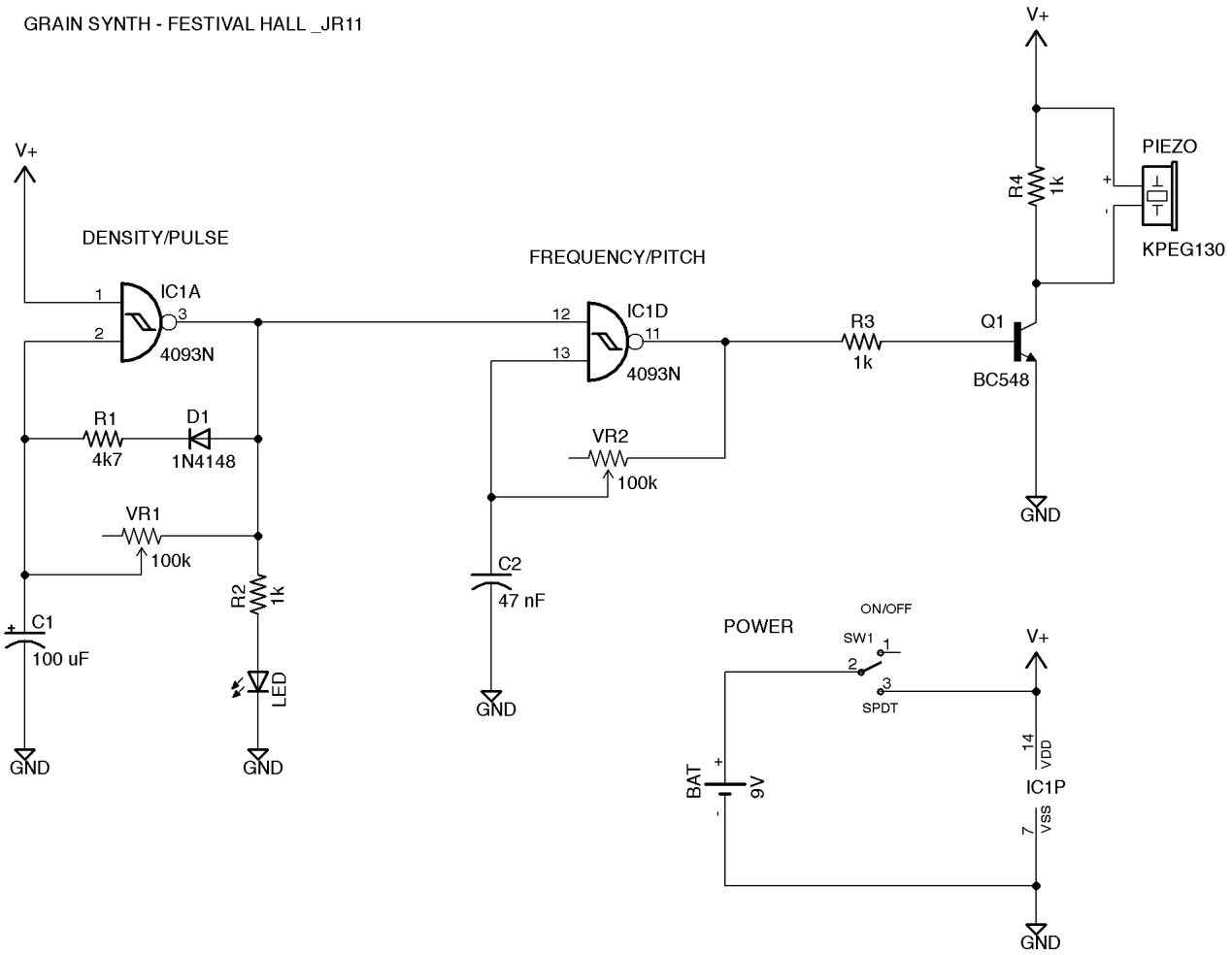
19. Switch - up/off, down/on.

20. Find the resonant frequency of the piezo transducer/sounder using the bottom trimpot. The piezo is designed to be loudest around 3kHz.

21. Change the density/frequency of the pulse/grain with the upper trimpot.

For more information see the download section of the Dirty Electronics website: www.dirtyelectronics.org

Appendix 1: Schematic



Appendix 2: Jumpers and Component Layout